water, and it is peculiarly unfortunate that Chicago, the largest city on the lakes, stands on a sinking plain that is now but little above the high-water level of Lake Michigan.

The two volumes on mineral resources contain a large amount of valuable information, much of it statistical. The products for 1896 showed only a slight increase in value over those for 1895. There are lengthy reports on iron-ores, on the iron and steel industries of all countries, and on the Witwatersrand banket and other gold-bearing conglomerates, most of which appear to be marine. The evidence given in reference to these auriferous deposits shows that in ancient formations the detrital gold is most likely to be found in marine shore deposits. There are shorter reports on copper, lead and zinc, on aluminium with references to bauxite from Georgia and Alabama, on quicksilver, manganese, nickel, cobalt, antimony, and platinum ; 163 ounces of platinum were obtained in the United States, and it is mentioned that a nugget weighing 20 ounces was found in Columbia, South America. Coal and coke are treated very fully, so also are petroleum and natural gas. Building-stones, clays, cement, precious stones, phosphates, mineral paints, and a variety of other substences are dealt with. It is noted that black shale is ground for the pigment known as mineral black. Fuller's earth has been reported from a number of localities. Observations have been made on various limestones considered likely to be useful for lithography, and it is reported that South Dakota promises to furnish suitable stone. The final report is devoted to mineral waters.

THE REPORT OF THE INTERNATIONAL AERONAUTICAL SOCIETY.

THE International Meteorological Conference of Paris, 1896 (NATURE, vol. liv. p. 523) appointed various committees to discuss and report on certain scientific questions. One of these committees was entrusted with all questions connected with the science of aeronautics, such as the scientific use of balloons and kites.

Of this committee, Dr. H. Hergesell of Strassburg was the chairman, and Dr. W. de Fonvielle the secretary.

The committee held a meeting at Strassburg, March 31-April 4, 1898, and the report of this meeting, in two languages—German and French—has just appeared.

The meeting was attended by some twenty-five gentlemen, for the most part original or co-opted members of the committee.

During the interval of eighteen months between the meeting in Paris and that at Strassburg, several concerted balloon ascents had been organised and carried out. The area over which balloons, either manned or simply fitted with registering apparatus, had been sent up, extended from St. Petersburg to Paris, and a fair number of balloons took part on each occasion.

The chief business of the Strassburg meeting was to receive and consider the reports of these concerted experiments, and from the experience gained to arrive, if possible, at improvements in apparatus and arrangements for future work.

Among other matters, the preparation of sufficiently sensitive thermographs, to register sudden alternations of temperature, was especially recommended, and also the use of liquid air for the purpose of testing thermometers liable to exposure to extreme temperatures in unmanned balloons.

An interesting paper by Mr. Rotch on his kite work at Blue Hill Observatory, Massachusetts, was also handed in and included in the report.

Various special reports will be found in the appendices.

NOTES.

A DEPUTATION will wait upon Mr. Balfour to-day to place before him reasons why national support should be given to an Antarctic expedition. It is understood that the Government is favourably inclined to the views of the deputation, and that the intention to make a grant towards the cost of the proposed expedition will be announced.

PROF. E. A. SCHÄFER, F.R.S., has been elected successor to the late Prof. Rutherford in the chair of physiology in the University of Edinburgh. Prof. Schäfer is forty-three years of age, and he has been Jodrell professor of physiology in University College, London, since 1863, when he succeeded Sir J. S. Burdon Sanderson.

THE annual conversazione of the Royal Society took place yesterday evening as we went to press.

SIR W. H. WHITE, K.C.B., F.R.S., will receive the freedom of the borough of Devonport on July 20, and will unveil, at the Technical School, a window descriptive of naval architecture.

DR. W. F. HUME, who during the last eight months has been carrying out a geological and topographical survey of the peninsula of Sinai, under the auspices of the Egyptian Government, has returned to Cairo with his survey party.

DR. CYRUS ADLER contributes to *Science* of June 2 and 9 a detailed account of the proceedings of the second conference on the International Catalogue of Scientific Literature, held at the Royal Society last October. The official Acta of the conference appeared in NATURE of October 27, 1898 (vol. lviii. p. 623).

M. PH. VAN TIEGHEM, Professor at the Museum of Natural History and President of the French Academy of Sciences, has been appointed to the chair of Biology of plants cultivated in France and the Colonies at the National Agronomic Institute, Paris; and M. G. Poirault succeeds the late M. Naudin as Director of the Laboratory for Higher Instruction at the Villa Thuret, Antibes.

PROF. ALFRED GIARD, the president of the section of zoology, anatomy, and physiology of the French Association for the Advancement of Science, has issued a circular in which he points out that as zoological members of the British Association will visit Boulogne, and attend some of the meetings of the French Association, the meeting will afford a good opportunity of discussing questions referring to pisciculture and marine fisheries. Papers dealing with the special zoology of the Channel or of the North Sea are therefore especially invited.

THE International Hydrographic and Biological Congress, which is to discuss the arrangement of periodical researches into the conditions of the North Sea and North Atlantic, was opened at Stockholm on Thursday last. M. Krusenstjerna, Minister of the Interior, delivered a speech, in which he welcomed the delegates in the name of the King of Sweden and Norway. Director-General Akermann (Sweden) was chosen president of the congress.

THE Liverpool School of Tropical Diseases is sending out to the West African coast a special expedition to investigate the causes of malaria and other diseases. The expedition will be headed by Major Ross, the recently-appointed lecturer, and will include Dr. Sunnett, the demonstrator to the Liverpool School. The party will start for Sierra Leone early in August, when the malarial season is at its height, and the conditions are most favourable for research. The expedition hopes to determine, by the methods which Major Ross employed in India, which are the malaria-bearing species of mosquito in the locality chosen, and then inquire whether it is possible, by filling up the particular puddles in which they breed, to exterminate malaria in a given district.

ON Saturday last, the French naval authorities, acting in conjunction with Mr. Marconi, conducted some successful experiments with wireless telegraphy, between a ship and the shore in the English Channel. The French storeship *Vienne* was used for the purpose. Up to Saturday the distance between the South Foreland and Boulogne, about twenty-eight miles, was the greatest space through which these messages have been transmitted. On Saturday messages were sent between the vessel and the English coast from off Boulogne, and afterwards at intervals, until the vessel was twelve or fourteen miles away from that port. The greatest distance through which the messages were transmitted was forty-two miles. It is stated that Mr. Marconi's method of limiting the area of influence of the waves used was successfully applied. The messages were sent at will either to Wimereux or to the South Foreland, without the other station being able to intercept them.

A MARINE exploring expedition to the mid-Pacific, under the direction of Prof. A. Agassiz, is being arranged by the U.S. Commission of Fish and Fisheries. The expedition will leave San Francisco about the middle of August, and proceed directly to Tahiti, in the Society Islands, which will be made the headquarters while the Paumotu Islands are being explored. In this archipelago, which is about 600 miles long, the *Albatross* will pass six or eight weeks. After returning to the Society Islands, the vessel will go to the Tonga, or Friendly Islands, where a week or ten days will be spent. Thence the vessel will sail for the Fiji Islands, where a short stay will be made, and thence to the Marshall Islands, visiting a number of the Ellice Islands and Gilbert Islands on the way. Six or seven weeks will be devoted to the exploration of the Marshall Islands. Between the Marshall Islands and the Hawaiian Islands, and between the latter and San Francisco, a distance of over 4000 miles, a line of deep-sea dredgings will be run, deep-sea townets being used while the dredging is going on. The *Albatross* is expected to return to the United States in April next year. Every effort is being made to thoroughly equip the vessel for deep-sea dredging, trawling and sounding; surface and intermediate towing; shore seining; fishing trials with lines and nets; land collecting, and other branches of the work. The newest apparatus for deep-sea and plankton investigations will be supplied. Special appliances are being constructed for use in the very deep water to be found about some of the islands.

A PARAGRAPH on the thermal conductivity of cast iron, as determined by Messrs. E. H. Hall and C. H. Ayres, appeared in NATURE of April 13 (p. 563). The thermal conductivity of the cast iron used was found to be about 0·1490 at 30° C. Mr. I. Thornton Osmond, Dean of the Pennsylvania State College, calls our attention to the fact that this result differs from values obtained under his direction in 1894, and described in the *Physical Review* of that year (vol. ii. No. 3, Nov.–Dec.). For the cast iron used in this investigation, the thermal conductivity from 60° C. to 90° C. or 100° C. was found to be a little over 0·09; and from 150° C. to 200° C. a little over 0·11. Mr. Osmond adds: "Though believing, from theoretical considerations, the conductivity to be a direct function of temperature, these figures were somewhat surprising; and I made preparation to have the work repeated through a greater temperature range and with great care; but this was never carried into effect. The method used was that of Principal Forbes, substituting thermopile and galvanometer for mercury thermometers, thus greatly reducing the cavities in the bar."

WE regret to learn that among other steps taken in reducing the expenditure of the Colony of Jamaica, it has been decided to withdraw the annual contribution towards the Weather Service, which has for the last eighteen years been under the control of Mr. Maxwell Hall, and to substitute a vote of 50*l.* for the collection and tabulation of statistics of rainfall and temperature. The letter from the Colonial Secretary seems to suggest that one reason for the step taken was that the full co-operation on the part of other Colonies and countries, which was necessary to make the scheme a complete one, was not forthcoming. The Service consisted of one first-class station, six stations of the second and third classes, and about two hundred rainfall stations. The vote was a very small one, and the director appears to have done good work, and to have been successful in issuing storm warnings and rainfall forecasts, although the latter could not reach those principally interested. Various useful investigations have been undertaken and published in the Jamaica Weather Reports, or elsewhere.

THE volume of hourly means of the readings obtained from the self-recording instruments at the five observatories under the Meteorological Council, just published for the year 1895, completes the lustrum 1891–1895; an appendix has therefore been added to the usual tables for the year in question, showing the mean values for that period. In addition to these values, hourly and other means of pressure, temperature and rainfall are given for four observatories, for a period of twenty-five years, and of sunshine for fifteen years. These averages afford valuable data for climatological or other more minute investigations. Further, in deference to a recommendation of the international meteorological conference at Paris in 1896, the hourly readings for some elements are given for two stations—Valencia Observatory as a typical Atlantic Coast station, and Kew Observatory as a typical inland station, and it is intended to continue this departure in future volumes.

PROF. ARRHENIUS contributes to the *Revue Générale des Sciences* an interesting account of his investigations into the causes of secular variations of temperature at the earth's surface. It is shown that widespread changes of mean temperature are more likely to be due to variations in the proportion of terrestrial rays absorbed by the atmosphere than to any variation connected with the solar rays, and that the absorption of terrestrial rays is most likely to be affected by changes in the amount of carbonic acid present in the atmosphere. Using Langley's data, it is calculated that if the amount of carbonic acid were diminished by a little more than half, the temperature would be lowered by about 4°·5 C., while an increase to two and a half or three times the present amount would raise the temperature about 8°·5 C., corresponding to the conditions of Glacial and Eocene times respectively. This calculation gives rise to some interesting speculation as to the possibility of such changes having taken place as the result of volcanic or erosive action, and the effect of the artificial consumption of carbon in raising the temperature of the air.

THE *National Geographic Magazine* for May contains a paper by Mr. J. B. Leiberg, entitled "Is climatic aridity impending on the Pacific slope?" The arid non-forested regions of eastern Oregon, and the semi-arid, sub-humid, and humid forest tracts are examined separately, and in each case evidence is found of adverse climatic change taking place in the direction of aridity.

THE parietal eye, with its adjacent organs, of the New Zealand Tuatera (*Sphenodon*) receives attention at the hands of Dr. A. Dendy in the May issue of the *Quart. Journ. Micr. Soc.* This functionless eye, which, although deeply buried in the integument, is better developed in the reptile named than in any other animal, has hitherto been very generally considered as an unpaired organ. Recent investigations, especially those of the author, point, however, to the conclusion that it was originally dual, like the other sense-organs; and that the parietal eyes were once serially homologous with the functional pair now possessed by vertebrates. In the Tuatera, it is believed that the single parietal eye now developed belongs to the left side, its fellow being represented by an organ of essentially similar structure known as the parietal stalk.

In the June number of *Nature Notes*, Mr. R. Morley calls attention to the great destruction of monkeys on the Gold Coast for the sake of their skins. It is stated that in the five years preceding 1892 the average annual export of their skins reached 175,000, with a value of 30,000*l.* As skins in prime condition are alone purchased, this may be taken to represent a yearly slaughter of 200,000 monkeys, mostly belonging to a species of Guereza (*Colobus vellerosus*). In 1894 the number of skins was 168,405, valued at 41,001*l.*; but in 1896 the number fell to 67,600, with a value of 8,662*l.* This shrinkage tells its own tale; and if effectual steps are not forthwith taken to stop the slaughter, it may be considered as certain that in a few years this very beautiful species will be practically exterminated.

In one respect at least it appears that the Madras University is in advance of kindred institutions at home, as students of history are required to possess some knowledge of ethnology and comparative philology. Surely it is time that the anthropological basis of history and sociology was fully recognised in British universities and colleges. Even the enlightened Madras University has to confess that there are no facilities for practical instruction at the colleges. Fully realising that information merely derived from books or lectures is insufficient for education, Mr. Edgar Thurston, the superintendent of the Madras Government Museum, has, with characteristic energy and enthusiasm, supplied the deficiency so far as he is able, and last year gave a course of demonstrations on practical anthropology at the museum. Mr. Thurston not only instructed the students in the technical methods employed, but demonstrated the forms of skulls and external characteristics of the living, and showed how the statistics so obtained elucidated the problems of the migrations of peoples. The collections of prehistoric archæology in the museum afforded proof of the antiquity of man, and the ethnographical collections illustrated the present condition of various tribes.

The "Struggle between Peoples" is the title of a short paper in the *Bulletins de la Soc. d'Anthropologie*, viii. p. 604, by Félix Regnault, in which he opposes the ordinary view that conquered peoples take refuge in the mountains. It is true the last resistance to invaders is made in the mountains, but that is by the mountaineers, and not by the inhabitants of the plains who have been driven into the mountains. M. Regnault also discusses the effect of a nomad people coming into contact with agriculturists: in some instances, the agriculturists win, and the conquered occupy the less fertile or arid lands; in other cases, the pastoral people conquer the tillers of the soil, but though they temporarily overwhelm them, the latter persist and emerge, and the pastors eventually maintain themselves only in those lands which are favourable to keeping flocks.

A highly interesting and important contribution to the study of immunity is to be found in a paper by Rudolf Emmerich and Oscar Löw, published in a recent number of the *Zeitschrift für Hygiene*. The authors have obtained from cultures of the *B. pyocyaneus* an enzyme which, when inoculated into animals infected with virulent anthrax bacilli, is able to entirely negative the action of the latter. Success has also attended their efforts to immunise animals against anthrax infection. The method of preparing the substance, which they call "pyocyanase-immun-proteïdin," is not yet perfect, and the details are promised in a later communication. This enzyme is also able to act deleteriously upon typhoid, diphtheria, and plague bacilli *in vitro*, and, curiously, is much more pronounced in its action under anaërobic conditions. It possesses a remarkable power of retaining its bactericidal properties under exposure to high temperatures. Thus 1½ hours of a temperature of from 85 to 90° C., and exposure for 1½ hours to a temperature of 98°·5, and being steamed for an hour at 98°·5 C., all fail to remove its beneficial characteristics. A prospect is now held out by these investigations of obtaining antitoxic substances in a far less costly and cumbrous manner than is involved in procuring curative serums through the medium of living animals; and perhaps the hope of the authors is not unjustified that, "by means of further improvements in immunising methods, the human and animal organisms may be ultimately protected from every conceivable kind of natural infection . . . it only depends upon obtaining the enzyme of certain pathogenic bacteria in the purest possible condition, and their harmless introduction into the body."

A curious instance of a polymorphous bacterium has been recently given by S. Hashimoto, of Sapporo (Japan), who, working in the Halle Hygienic Institute, has found a microbe which assumes at one time the appearance of small motile rods, at another that of thick, plump cocci hanging together in chains of from ten to twenty individuals, whilst yet more interesting is its assumption of the sarcina form, grouped together in packets consisting of from eight to sixteen individual cells. Every precaution was taken to meet the not unwarranted suspicion that these various appearances were simply due to working with an impure cultivation, but even such a master in technique as Prof. Fraenkl could discern no flaw in the manipulations, and moreover was able to confirm in every particular the interesting discovery of his pupil. The microbe in question was originally obtained from an agar-plate which had been mixed with imperfectly sterilised milk, previously kept for some days in an incubator.

In the June number of the *American Journal of Science* appears a full and detailed memoir of the life and works of the late Prof. O. C. Marsh, with a portrait. Especial interest attaches to the account of his early journeys into Indian territory; and the exposure of the nefarious treatment of the Indians themselves, which he was so largely instrumental in bringing about. The paper concludes with a complete list of Marsh's publications. The writer agrees with the opinion already expressed in this journal, that the time is not yet ripe for forming an adequate estimation of the late Professor's labours.

Bulletin No. 61 of the Massachusetts Agricultural College (Hatch Experiment Station) is devoted to an account of the life-history of the asparagus-rust, *Puccinia asparagi*, and of the best modes of treatment of plants infested with it.

In a recent number of Bonnier's *Revue générale de botanique*, M. Guignard records some remarkable observations on the mode of impregnation in *Lilium martagon*. He claims for the two generative nuclei of the pollen-tube the term "antherozoids," to indicate their homology with the corresponding bodies in Gymnosperms and in the higher Cryptogams. Although not provided with cilia, they both elongate and assume a vermiform appearance before entering the embryo-sac, the indications of a spiral form being still evident. The two "antherozoids" both take part in the process of impregnation, the one fusing with the ovum-cell or oosphere, the other with the secondary nucleus of the embryo-sac, or with one of its constituent polar nuclei, to form the endosperm. There is, therefore, in *Lilium martagon*, according to M. Guignard, a double process of conjugation; but the union of the "antherozoid" with the secondary nucleus of the embryo-sac he regards as a process of "pseudo-fecundation." Similar results have been obtained by Prof. S. Nawaschin, and they have been confirmed by Miss Ethel Sargant in a paper read before the Royal Society on May 4.

THE third part of the series of memoirs, in course of publication by the Cambridge University Press, on the material collected during Dr. Arthur Willey's expedition to the Pacific in search of the eggs of the Pearly Nautilus, has just been issued. Three papers are contained therein, dealing respectively with orthogenetic variation in the shells of Chelonia, by Dr. Hans Gadow; Enteropneusta from the South Pacific, by Dr. Willey; and a collection of Echiurids, by Mr. A. E. Shipley.

AN account of the communications and discussions at the International Congress of Zoologists, which met at Cambridge in August last, was given in NATURE at the time of the meeting (vol. lviii. p. 424). A fine volume of *Proceedings*, edited by Mr. Adam Sedgwick, F.R.S., has now been published by Messrs. C. J. Clay and Sons. The volume contains the papers and addresses read before the congress, with reports of remarks made upon the subjects of these communications, and also during the discussions of specific points of zoological importance. Fifteen coloured plates are appended to the volume to illustrate some of the papers. The nature of the contents can be judged from our summary of the work of the congress, and the editor is to be congratulated upon being able to see the *Proceedings* published nine months after the meeting. Few official reports of international congresses appear with such commendable promptitude.

A DIAZO-BODY is a substance obtained by the interaction of nitrous acid and an amine (such as aniline) under certain conditions of temperature. Perhaps no other reaction in organic chemistry is so important either theoretically or technically, and it is so fundamental that the term "to diazotise" has been coined to express the operation. Diazo-compounds are of the general type $R.N=N.OH$, where R may be any benzene group (C_6H_5, and so on), and are distinguished by their great instability and explosive power, tending to give off nitrogen. By very simple reactions the substance $R.N=N.OH$ may be made to give $R.OH$, $R.Cl$, RBr, RI, RH, $R.NH_2$, $R.NH.NH_2$. In many questions of constitution of benzene ring compounds, the exchange of the diazo-group for the sulphonic group is a necessary step in the argument. The methods hitherto proposed for carrying out this reaction give, in general, very bad yields and involve the production of evil-smelling thio-compounds as intermediary products. In a recent number of the *Berichte*, Dr. Ludwig Gattermann describes a very elegant method, the discovery of which, he states, was due to a happy accident which depends upon the formation of a sulphinic acid directly from the diazo-compound. The diazo solution, preferably as sulphate, is mixed with an excess of sulphuric acid and saturated with sulphur dioxide, and then treated at 0° C. with finely-divided metallic copper, when the sulphinic acid is formed in practically theoretical quantity. The method has been found to be of wide applicability, equally good yields being obtained in the naphthalene series.

THE additions to the Zoological Society's Gardens during the past week include a Hoolock Gibbon (*Hylobates hoolock*, ♂) from Upper Burma, presented by Mr. S. B. Bates; two Blue-bearded Jays (*Cyanocorax cyanopogon*) from Brazil, presented by Mr. Arthur Ussher; a Laughing Kingfisher (*Dacelo gigantea*) from Australia, presented by the Hon. A. Littleton; two Black-bellied Sand-Grouse (*Pterocles arenarius*) from Asia, presented by Mr. G. P. Torrens; twelve Sharp-headed Lizards (*Lacerta dugesi*) from Madeira, presented by Mr. R. H. Archer; two Green Lizards (*Lacerta viridis*), a Tessellated Snake (*Tropidonotus tessellatus*), a Common Snake (*Tropidonotus natrix*), European, presented by the Rev. F. W. Haines; a Northern Mocking-Bird (*Mimus polyglottus*) from North America, presented by Mr. C. Gillett; a Greater Sulphur-crested Cockatoo (*Cacatua galerita*) from Australia, two Spiny-tailed Iguanas (*Ctenosura acanthura*) from Central America, deposited; two Derbian Screamers (*Chauna derbiana*) from Colombia, two Palm Squirrels (*Sciurus palmarum*) from India, a Diamond Python (*Python spilotes*) from Australia, purchased; two Burrhel Wild Sheep (*Ovis burrhel*, ♂ ♀), two Jameson's Gulls (*Larus novae-hollandiae*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

TEMPEL'S COMET 1899 *c* (1873 II.)—M. L. Schulhof has calculated new elements and a continued ephemeris for this comet, using the positions supplied from the observations of Messrs. Perrine and Javelle, made at Lick and Nice respectively. *Astr. Nach.* (Bd. 149, No. 3574).

Elements.

T = 1899, September 6·0 Paris Mean Time.

	°	′	″	
$M =$	7	21	50·5	
$\pi =$	185	36	20·0	1899·0
$\Omega =$	120	57	56·3	
$i =$	12	38	52·6	
$\phi =$	32	49	38·7	
$\mu =$	671″·9166			

Ephemeris for 12*h*. *Paris Mean Time.*

1899.		R.A.			Decl.			Br.
		h.	m.	s.	°	′	″	
June 25	...	20	8	16·8	... – 7	23	2	... 2·282
26	...		9	36·7	... 7	40	5	
27	...		10	56·1	... 7	57	54	
28	...		12	15·0	... 8	16	30	
29	...	20	13	33·4	... – 8	35	52	... 2·525

COMET 1899 *a* (SWIFT).—Dr. A. Stichtenoth, of Kiel, contributes a continued ephemeris of this comet to *Astr. Nach.* (Bd. 149, No. 3574).

Ephemeris for 12*h*. *Berlin Mean Time.*

1899.		R.A.			Decl.		Br.
		h.	m.	s.	°	′	
June 22	...	14	38	41	... + 27	37·1	... 0·27
23	...		36	6	... 26	39·4	
24	...		33	43	... 25	44·1	... 0·23
25	...		31	34	... 24	51·3	
26	...		29	34	... 24	0·8	
27	...		27	44	... 23	12·6	
28	...		26	3	... 22	26·4	... 0·17
29	...	14	24	31	... + 21	42·3	

During the week the comet travels almost in a direct line between the stars ϵ and α Bootis. It can only with difficulty be now detected with telescopes of less than three inches aperture.

SPECTRA OF RED STARS (CLASS III. *b*).—In August last, 1898, results of a photographic study of the stars of Secchi's Type IV. (Vogel's III. *b*), made by Mr. Ellerman and Prof. G. E. Hale at the Yerkes Observatory, were discussed at the Harvard Conference (*Astro-Physical Journal, vol. viii. p. 237, 1898*). The photographs were obtained with a spectrograph having only one prism and a long-focus camera (20·0 inches). Since that time the spectrograph has been remodelled and provided with a train of three prisms and a shorter focus camera (10·8 inches), and with this instrument much better photographs have been obtained with shorter exposures. *Bulletin* No. 7 of the Yerkes Observatory contains a short description of these, with a plate showing the spectra of four stars of this class (*Astrophysical*